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Agricultural Memorandum No 673

The significance of 90% critical periods for Potato Blight

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Hitherto, the interpretation of the significance of Beaumont periods has been a process of applied experience.

Analysis of the 90% (1300-1200h) periods for the data mentioned in Ag Mem 672 has shown that certain quantitative rules could be evolved, with a fair degree of success.

The Blight Index is the sum of the hours above 89% RH within the critical or near critical periods occurring after June 14th up to the date in question. The Appendix gives details for 9 stations in the 7 year sample of the number of such hours up to the outbreak date.

An attempt was made to formulate rules, applicable on July 1st, July 11th and July 26th. This approach indicated that critical periods in the second half of June are likely to be of far greater importance than has hitherto been realized.

Some evidence is also presented to show that the carry-over of infection from the previous year can have an effect on the rapidity of disease development.

No attempt has been made to investigate the length of the intervals between critical periods, which may be important.

The results are as follows:-

Rule 1 — If the Blight Index for June 15-30 is 55 or more an outbreak will occur in the first 15 days of July.

Correct — Nos 1, 2, 3, 4, 5, 6, 8, 10, 11. (9 out of 12 occurrences)

Anomalies — No 16 Index 115, outbreak 22 July (1968)
No 23 Index 66, outbreak 28 July (error) (1970)
No 48 Index 60, outbreak 15 August (serious error) (1967)

Rule 2a — If the Blight Index for June 15-30 is 30-55 and for June 15-July 10 is 75 or more, an outbreak will occur between 14th July and 1 August.

Correct — Nos 7, 12, 15, 19, 24, 30. (6 out of 8 occurrences)

Anomalies — No 40 Index 113, outbreak Aug 11 (1971)
No 59 Index 91, outbreak Aug 19 (1970)

Rule 2b — If the index June 15-30 is 30-55 and for June 15-July 10 is less than 75, an outbreak will occur in August.

Correct — Nos 39, 45, 47, 54, 58.

Anomalies — No 13 Index 33, outbreak July 16 (1967)
No 17 Index 36, outbreak July 25 (1969)

Rule 3a — If the index for June 15-30 is less than 30 no outbreak will occur before July 25.

Correct on 37 occasions, wrong on 2.

Anomalies
No 9 Index 24, outbreak July 15 (1966)
No 14 Index 0, outbreak July 17 (1966)

Rule 3b — If the index for June 15-30 is less than 30, and for June 15-July 25th is 70 or more, an outbreak will occur before August 10.

Correct on 8 occasions.

Anomalies
No 52 Index 104, outbreak Aug 15 (1972)
No 56 Index 81, outbreak Aug 16 (1968)
No 57 Index 130, outbreak Aug 16 (1972)
No 60 Index 71, outbreak Aug 26 (1968)

Rule 3c — If the index for June 15-30 is less then 30, and for June 15-25th is less than 70, the outbreak will be later than August 9.

Correct on 16 occasions.

Anomalies
No 9 Index 54, outbreak July 15 (1966)
No 22 Index 45, outbreak July 28 (1966)
No 14 Index 22, outbreak July 17 (1966)
No 27 Index 0, outbreak July 30 (1966)
No 28 Index 0, outbreak Aug 1 (1969)
No 29 Index 23, outbreak Aug 1 (1969)
No 31 Index 0, outbreak Aug 4 (1970)

Summary	Correct	Wrong	
Rule 1	9	3	early
Rule 2(a)	6	2	early
Rule 2(b)	5	2	late
Rule 3(a)	37	2	late
Rule 3(b)	8	4	early
Rule 3(c)	16	7	late
	81	20	

Thus approximately 10% forecasts are too early, 10% too late and 80% correct.

Analysis of late errors

Rule 2(b) Nos 13 and 17 both refer to Manston. It may be that the outbreaks occurred on Romney Marsh where different weather might have been experienced.

Rule 3(a) Nos 9 and 14 refer to Boscombe Down and Ringway. At Boscombe Down in 1966 there was a 'near miss' on June 13-14 and again around June 26th. The Ringway humidities may at times be low owing to a 'civil airport' exposure.

Rule 3(c) Nos 9 and 14 have already been discussed.
No 22 Thorney Island 1966 - no explanation
No 27 Elmdon 1966 - another possible 'civil airport' effect.
No 28 Leeming 1969 - no explanation
No 29 Thorney Island 1969 - outbreak on early potatoes June 4th.
No 31 Elmdon 1970 - see above

Effect of carry-over of infection from previous year

A parallel investigation is being carried out in collaboration with Dr H E Croxall regarding potential carry-over of infection. This has suggested that in the East Midlands, 1967-8 and 1968-9 were high carry-over years, and that the three succeeding years had a low carry-over.

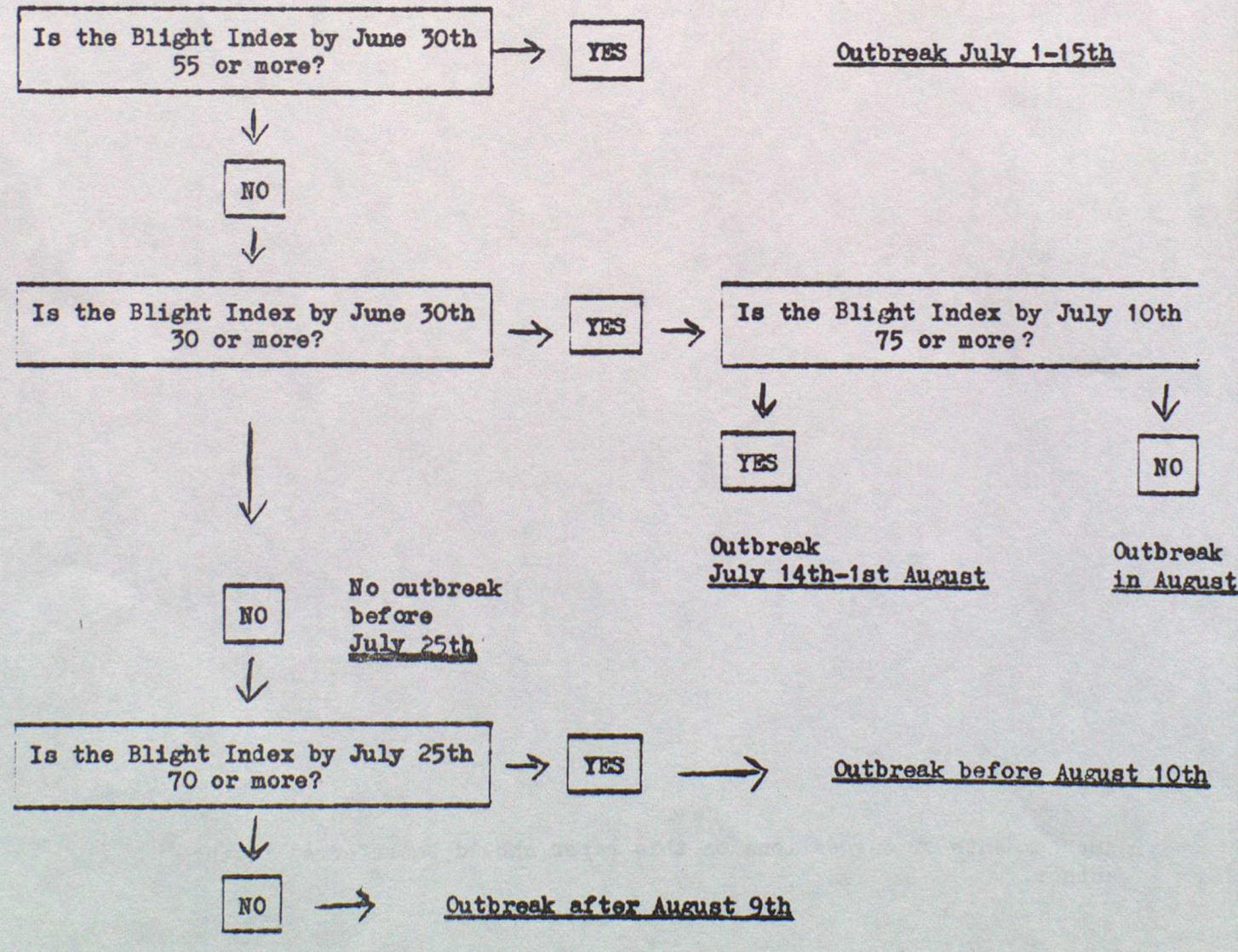
Examination of the mean Blight Indexes for Leeming, Waddington and Mildenhall show:-

	High	Low
Mean Index to outbreak date	113	175
Mean Index to 5 days before outbreak date	82	140

This confirms that infection carried over from the previous year, largely depended on the August or September rainfall and hence the liability to tuber infection, is worth taking into account. This investigation continues.

Summary

START COUNTING JUNE 15TH



Note A critical 90% period is at least two consecutive days, each with 11 or more hours of R.H. above 89%. A near critical period has a minimum of 10 such hours. The Blight Index is the sum of such hours in the critical or near critical periods.

Suggested Plan

Action on July 1st if Index over 54
Action until July 11th if Index reaches 75
Action until July 26th if Index reaches 70

Any comments or suggestions on this paper should be referred to the author.

Meteorological Office
Bracknell

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APPENDIX

Blight Index - the number of hours with R.H. above 89% falling in critical or near critical periods up to outbreak day

Number	Station	Year	Outbreak	June 15-30	July 1-10	July 11-25	July 26-31	August 1-16	After Aug 16	Notes
1	Valley	1966	July 8	86	84					
2	Manston	1968	" "	129	12					
3	Wadd.	1966	July 12	57	0	0				Carry over - Medium to Low
4	Thorney	1967	" "	113	0	0				
5	Valley	1967	" "	60	23	0				
6	Elmdon	1967	July 14	57	0	0				Also outbreak August 16
7	Mild.	1968	" "	48	28	33				Carry over - High
8	Valley	1971	" "	115	27	0				Also outbreak June 30
9	Bosc. D.	1966	July 15	24	30	0				Near critical June 13-14
10	Wadd.	1968	" "	60	49	38				Carry over - High
11	Thorney	1968	" "	126	36	31				
12	Elmdon	1971	" "	30	67	12				Also outbreak July 28
13	Manston	1967	July 16	33	0	0				
14	Ringway	1966	July 17	0	22	0				
15	Valley	1968	July 18	50	39	0				
16	Bosc. D.	1968	July 22	115	44	19				
17	Manston	1969	July 25	36	0	22				
18	Manston	1972	" "	0	38	145				
19	Valley	1972	" "	53	39	38				
20	Manston	1966	" "	0	0	70				
21	Thorney	1972	July 26	0	85	53				
22	Thorney	1966	July 28	20	25	0	0			Also outbreak July 1st
23	Valley	1970	" "	66	59	108	57			
24	Elmdon	1971	" "	30	67	33	0			Also outbreak July 15
25	Bosc. D.	1972	" "	29	74	100				
26	Mild.	1966	July 29	0	26	49	11			Carry over: Medium to Low
27	Elmdon	1966	July 30	0	0	0	0			
28	Leeming	1969	Aug 1	0	0	0	27			Carry over: High
29	Thorney	1969	" "	0	0	23	24	12		
30	Bosc. D.	1971	" "	45	48	38	45	11		
31	Elmdon	1970	Aug 4	0	0	0	19	21		
32	Valley	1969	Aug 5	14	29	114	0	35		
33	Leeming	1971	Aug 5	27	0	47	51	36		Carry over: Low
34	Manston	1971	" "	29	82	23	54	0		Also outbreak July 1st
35	Wadd.	1972	Aug 8	0	28	130	12	27		Carry over: Low
36	Leeming	1967	Aug 10	0	0	34	0	27		Carry over: Medium to Low
37	Mild.	1967	" "	0	0	0	0	28		Carry over: Medium to Low
38	Leeming	1970	" "	0	0	21	0	61		Carry over: Low
39	Leeming	1966	Aug 11	47	0	0	0	26		Carry over: Medium to Low
40	Wadd.	1971	" "	36	60	29	50	34		Carry over: Low
41	Wadd.	1969	" "	0	0	28	62	89		Carry over: High
42	Elmdon	1969	Aug 12	0	0	0	35	73		
43	Ringway	1967	Aug 13	28	0	0	0	44		
44	Mild	1969	" "	0	0	0	35	27		Carry over: High
45	Ringway	1970	" "	30	0	0	29	24		
46	Thorney	1971	" "	0	28	0	23	0		
47	Ringway	1971	" "	32	0	0	0	12		

Number	Station	Year	Outbreak	June 15-30	July 1-10	July 11-25	July 26-31	August 1-16	After Aug 16	Notes
48	Bosc. D	1967	Aug 15	60	0	46	84	79		
49	Wadd.	1970	" "	0	0	25	26	54		Carry over: Low
50	Manston	1970	" "	0	21	20	0	116		
51	Thorney	1970	" "	27	27	0	58	34		
52	Leeming	1972	" "	0	0	104	0	33		Carry over: Low
53	Ringway	1972	" "	0	0	43	0	0		
54	Wadd.	1967	Aug 16	44	0	54	0	54		Carry over: Medium to Low
55	Elmdon	1967	" "	57	0	0	0	20		Also outbreak July 14th
56	Leeming	1968	" "	0	56	25	0	75		Carry over: High
57	Mild.	1972	" "	0	28	102	34	26		Carry over: Low
58	Mild.	1971	Aug 17	32	35	31	37	78		Carry over: Low
59	Bosc. D.	1970	Aug 19	42	49	50	49	50	17	
60	Ringway	1968	Aug 26	0	48	23	0	0	0	
61	Mild.	1970	Aug 29	0	0	0	0	32	42	Carry over: Low
62	Ringway	1969	Sept 16	0	0	22	0	67	75	
63	Elmdon	1968	none	20	27	0	0	0	0	
64	Bosc. D.	1969	none	0	0	0	0	48	35	